

MARSHALL STAR

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Jan. 16, 2003

During STS-107 Shuttle flight, companies to test environmentally friendly, mist fire-fighting system

by Tracy McMahan

During the January flight of Space Shuttle Columbia, astronauts will test a new commercial fire-fighting system that puts out blazes with a fine water mist — instead of using harmful chemicals or large quantities of water that damage property.

“The fire-fighting industry is in search of a new tool that doesn’t use dangerous chemicals or douse fires with huge quantities of water that cause extensive property damage,” said Mark Nall, director of the Space Product Development Program at the Marshall Center. “By flying this commercial experiment on the STS-107 Columbia mission, NASA is helping industry design a cost-effective, environmentally friendly system for putting out fires.”

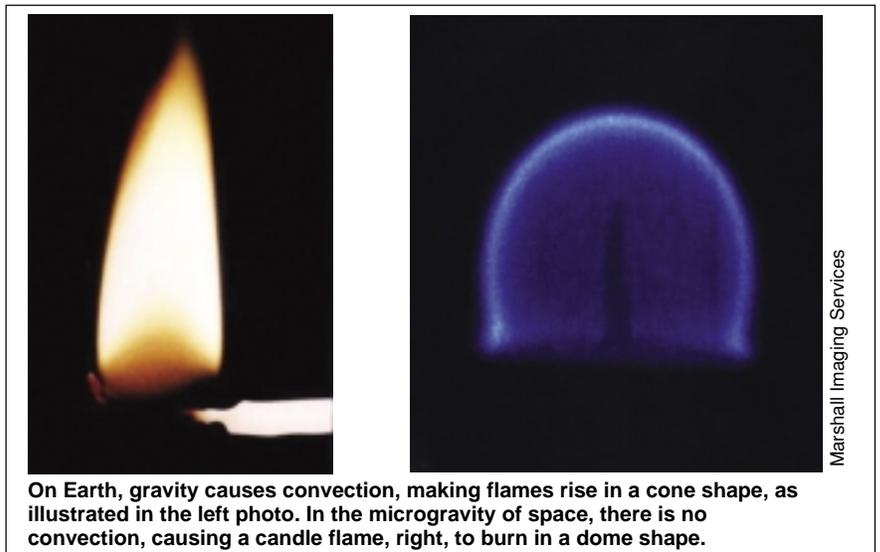
Until recently, halons, bromine-based compounds, were used to attack fires

chemically — especially in places like computer rooms, aircraft, and document storage rooms where water sprinklers were inappropriate. In 1998, the production of these chemicals was banned worldwide because they damage Earth’s protective ozone layer. This part of the atmosphere

shields us from the Sun’s harmful ultraviolet radiation.

“We are working to find an acceptable replacement for halons, and water mist appears to be the best choice,” said Dr. Thomas McKinnon, lead scientist for the

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On Earth, gravity causes convection, making flames rise in a cone shape, as illustrated in the left photo. In the microgravity of space, there is no convection, causing a candle flame, right, to burn in a dome shape.

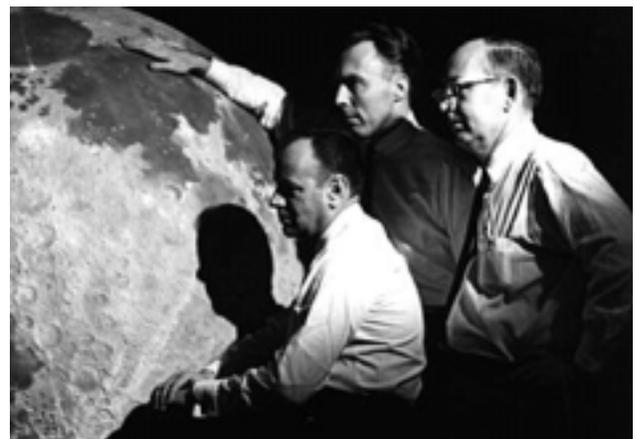
Aviation pioneer, X-15 designer Charlie Feltz dies at 86

from NASA Headquarters

Pioneer aviation engineer Charlie Feltz passed away on Jan. 3. He was 86. Feltz began his career in aviation with the North American Aviation Co. in California in the 1940s working on the P-51 Mustang. Regarded as a brilliant engineer, he made innumerable contributions to the advancement of high-speed aeronautics and space flight. His career spanned the height of piston-powered aircraft, through the birth of jet and rocket powered craft, to the Apollo and Space Shuttle programs.

He is most often remembered for his pioneering and innova-

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Charlie Feltz, right, with fellow engineers and a mock-up of the Moon’s surface.

NASA's 10th annual 'Great Moonbuggy Race' set for April

by Jack Robertson

Hundreds of high school and college students from throughout the United States will meet the challenge to "race like they're on the Moon" in NASA's Great Moonbuggy Race April 11-12.

The race is held annually at the U.S. Space & Rocket Center.

The Marshall Center sponsors the event as a way to motivate the next generation of engineers and scientists. This will mark the 10th year for student teams to tackle designing, building and racing human-powered vehicles over a lunar-like obstacle course.

High school teams will race Friday, April 11, and college teams will take to the course Saturday, April 12.

The Great Moonbuggy Race is inspired by development some 30 years ago of the Lunar Roving Vehicle, a program managed by engineers at the Marshall Center. That team's challenge was to design a compact, lightweight "all-terrain vehicle" that could be transported to the Moon in the relatively small Apollo spacecraft. Astronauts used separate lunar rovers on the final three Moon missions — Apollo 15, 16 and 17, to travel 52.51 miles while gathering 620.6 pounds of rock and soil samples for return to Earth.

"It's hard to believe it's been a decade since our first Great Moonbuggy Race — and more than 30 years since our astro-



Photo by Doug Stoffer, NASA/Marshall Center

Auburn University students maneuver their moonbuggy across the simulated lunar terrain during last year's race.

nauts took their first moonbuggy ride on July 31, 1971," said Durlean Bradford, Moonbuggy Race coordinator in the education department at the Marshall Center. "We expect a lot of returning schools for this anniversary race — maybe the biggest field of competitors ever. We encourage teams to register early and get started today on their moonbuggy."

In 2002, 33 college teams from 18 states and 27 high school teams representing nine states and Puerto Rico vied for the top three places in each division. A university from Colombia participated as an exhibition team.

Students face a variety of real-world engineering problems while designing and building their moonbuggies. The challenge continues when a male and a female race each vehicle over a half-mile course of simulated lunar terrain, encountering man-made craters, rocks, ridges and soft soil.

Prizes are awarded not only for the fastest vehicles, but also to the team whose design represents the best technical approach to solve the engineering problem of navigating the simulated lunar surface.

"This is fun, but it's also downright hard work for the teams," Bradford said. "They put in countless hours to come up with their design, figure out what works, build the moonbuggy and then race it. Their math, science, engineering, design and teamwork skills are all put to the test."

For more information on how to participate in the race, contact Bradford at (256) 544-5920. For more information about the event, go to <http://moonbuggy.msfc.nasa.gov>.

The writer, an employee of ASRI, supports the Media Relations Department.

Technology used to combat astronaut motion sickness to be available in March for other human health uses

NASA Headquarters release

NASA developed an innovative technology to help astronauts combat motion sickness during space flight and it becomes available in March for a much wider range of human health and performance uses.

Dr. Mae C. Jemison, America's first African-American female astronaut, and BioSentient Corp., Houston, obtained the license to commercialize the space-age technology known as Autogenic Feedback Training Exercise (AFTE). AFTE was originally developed by Dr. Patricia Cowings of NASA's Ames Research Center, Moffett Field, Calif. The technique is a patented combi-

nation of biofeedback and autogenic therapy that allows individuals to eliminate or minimize their unwanted physical responses to outside stimuli by controlling their autonomic nervous system (ANS). The ANS is responsible for controlling and regulating involuntary bodily functions, such as breathing, heartbeat, sweating, blood vessel dilation and glandular secretions.

"What were previously considered involuntary, or autonomic, responses are in fact under voluntary control if you are taught properly," said Cowings, who developed AFTE. "I have never met anyone who could not control their bodily responses to some

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Flame

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research at The Center for Commercial Applications of Combustion in Space (CCACS) at the Colorado School of Mines in Golden. This NASA Commercial Space Center specializes in helping industry conduct combustion research in space through NASA's Space Product Development Program at the Marshall Center.

"The Shuttle tests use a humidifier-like device to produce water drops about 20 microns in size," said Dr. Angel Abbud-Madrid, the project scientist at the NASA Commercial Space Center. "That's about one-tenth the diameter of a human hair, as opposed to drops produced by conventional sprinklers that are about one millimeter, or 50 times the size of our droplets."

The water mist research team is working with MicroCool Inc., a division of Nortec Industries Inc., in Palm Springs, Calif., and Fogco Systems Inc. in Gilbert, Ariz. These companies manufacture water mist systems for putting out fires and for other purposes, such as outdoor cooling and industrial humidification.

"Firefighters in Denver and at the Arvada Fire Training and Research Center have tested our ultra-fine mist nozzles," said Mike Lemche, general manager of MicroCool. "The cooling effect of this mist removes one of the key components of fire — heat."

Gary Wintering, president of Fogco, said his company will use information from the STS-107 experiment to fine-tune their designs of fire-fighting systems. Water mist systems create a fog instead of sending out blasts of water. Since the fog removes heat and replaces oxygen as the water evaporates, it prevents the fire from expanding and starting new fires.

This is particularly important when fire starts in a closed compartment on a ship, aircraft, or even on the Space Shuttle. The U.S. Navy is already working with the airline industry and The Center for Commercial Applications of Combustion in Space on water mists studies.

"With halon replacements expected to be an important part of the \$2-billion-a-year fire suppression industry, it is easy to understand why companies are flying this experiment," said Dr. Frank Schowengerdt, director of The Center for Commercial Applications of Combustion in Space. "These companies are testing the system in space because it's easier to observe the interaction between a flame and water when Earth's gravity does not cause air currents around the flame and does not cause water droplets to settle."

Prior combustion experiments have shown that space is the ideal place to study the physics of fire. On Earth, gravity causes



Crewmembers of STS-107 at Glenn Research Center train with the Combustion Module.

Marshall Imaging Services/NASA-Glenn Research Center

lighter, hotter air to rise — creating air currents that make it difficult to study combustion processes. In microgravity — the low-gravity inside the Shuttle orbiting Earth -- air currents are reduced or eliminated, making it easier for scientists to observe exactly how water interacts with a flame to put it out.

"The Shuttle experiment will help us determine the optimum water concentration and water droplet size needed to suppress fires," said Abbud-Madrid. "We have learned from short tests on NASA's KC-135 reduced-gravity aircraft and inside drop towers that water mists take one-tenth the water of traditional sprinklers to extinguish a flame."

More extensive measurements in periods of microgravity longer than a few minutes will be possible during the Space Shuttle Columbia's 16-day mission. A mixture of propane and air will ignite inside a clear tube to produce a thin flame — known as

a laminar flame. On the opposite end of the tube, a water mist will be released. Digital images will record how different size water droplets and water concentrations affect the flame.

The experiment will take place inside the safety of the Combustion Module — a NASA facility flown on a previous Shuttle flight. It was developed by NASA's Glenn Research Center in Cleveland, Ohio, and is the forerunner of a similar facility under development for the International Space Station.

Future water mist investigations on the Space Station will be larger and longer, enabling companies to test different water injection systems, droplet sizes and fire scenarios.

The writer, employed by ASRI, supports the Media Relations Department



Astronaut Janice Voss works with the CM-1 Combustion Module during the STS-94 mission in 1998.

Marshall Imaging Services

Feltz

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tive design of the X-15 manned rocket plane, one of NASA's and America's most ambitious and successful research flight programs.

The X-15 flew 199 times. It set speed and altitude records, reaching the lower reaches of space and achieving a record speed of Mach 6.7. The body of aerospace knowledge generated by the X-15 research flights laid the foundation for many successes in the current Space Shuttle era.

As the Chief Engineer at North American on the X-15 program, he helped develop thin, ablative heat resistant coatings and ceramic tiles for critical control surfaces, new manufacturing methods for Titanium, subsystems designed to operate in zero gravity, a new man-rated rocket engine, and unpowered landing techniques, all of which were eventually applied to Space Shuttle technology.

As president of the Rockwell Space Transportation System Development & Production Division, he led the team responsible



Marshall Imaging Services

The X-15

for the design, development, integration, production and field site operations for the Shuttle program.

Health

Continued from page 2

degree the first time they tried. It's a function of knowing what to do."

AFTE consists of a system of compact, ambulatory equipment to measure, record and display real-time ANS functions. It is combined with a unique six to 12-hour training session to teach individuals how to control their physiology using the feedback from the equipment. Advancing the original design, BioSentient has created a seamless system that includes a garment a person wears that can measure and wirelessly transfer physiologic data in real time; a small wrist display; and a computer station that a trainer can use to capture the data, monitor and teach a person the regulation techniques.

In various controlled studies conducted at NASA, Cowings found that AFTE is 85 percent effective in reducing motion side effects in both men and women, and individuals for up to three years after initial training retain it.

Since the mid-1980s, AFTE has been used successfully with U.S. astronauts, payload specialists and Russian cosmonauts. It has been used successfully to return U.S. Navy pilots suffering severe airsickness to active duty in high-performance aircraft.

"BioSentient is examining AFTE as a treatment for anxiety, nausea, migraine

and tension headaches, chronic pain, hypertension, hypotension, and other stress-related disorders," Jemison said. She took the training and successfully used it during her Space Shuttle flight, STS-47, in 1992. "Over 13 percent of adult Americans suffer from anxiety disorders, like the public speaker who panics or the athlete who 'chokes' on the field. With AFTE these individuals can learn to control that anxiety without it controlling them."

Jemison, who also is a physician and chemical engineer, said, "Other potential beneficiaries of AFTE include business executives, homeland security and law enforcement officers, air traffic controllers, nuclear power plant operators and others working in hazardous materials occupations where optimal personal performance and situational awareness are essential."

Those who provide services to patients such as psychologists, psychiatrists, psychophysiologists, cardiologists, neurologists, physical therapists, athletic trainers, biofeedback practitioners and rehabilitation and behavioral therapists can use AFTE. By training their patients and or trainees, these specialists can teach people how to control their physiology without pharmaceutical help.

Job announcements

MS03C0029, Program Analyst. GS-343-11, Space Transportation Directorate, Business and Administrative Office. Competitive Placement Plan. Closes Jan. 27.

MS03C0032, AST, Tracking and Telemetry Systems Team Lead. GS-0855-14, Engineering Directorate. Closes Jan. 17.

MS03C0033, Program Analyst, GS-343-12, Space Transportation Directorate, Business and Administrative Office. Competitive Placement Plan. Closes Jan. 27.

Obituaries

Johns, Fay Harrison, 75, of Killen, died Oct. 23. Burial was in Tri-Cities Memorial Gardens with Elkins Funeral Home directing.

She retired from the Marshall Center in 1982, where she worked as a secretary. She was the widow of Leonard Johns.

Johns is survived by two sons, Timothy L. Johns of Killen and Michael Johns of Texas; three brothers, Milner Harrison of Florence and Jimmy and Ralph Harrison, both of Killen; three sisters, Violet Cole of Killen, and Mable Fullerton and Jean Penn, both of Florence; and three grandchildren.

Center Announcements

Stephenson to accept award at King unity breakfast

Marshall Director Art Stephenson will receive the Unity Award at the Martin Luther King Jr. Unity Breakfast on Monday. Tickets for the breakfast are \$25 and are available at Bldg. 4200, Room 716. The event will be at 8 a.m. at the Von Braun Center's North Hall. For more information, call Chanel Leslie at 544-3740.

SHARP mentors needed for student education programs

The Marshall Center's Education Programs Department needs volunteers to work with students participating in the 2003 NASA Summer High School Apprenticeship Program. SHARP offers high school students opportunities to participate in an eight-week science and engineering program. Researchers and other science and engineering professionals are encouraged to volunteer as mentors. For more information, call 544-6025.

Weight Watchers session to begin Jan. 23

The Weight Watchers group will begin a 15-week session on Jan. 23. Cost is \$165 and the program is open to all civil service and contractors at the Marshall Center. To sign up, or for more information, call Rachael Towle at 544-1525.

CFC accepting applications for 2003 coordination

The Local Federal Coordinating Committee for the Tennessee Valley Combined Federal Campaign is accepting applications through Jan. 24 for a Principle Combined Fund Organization (PCFO) to administer the 2003 campaign. The PCFO is responsible for campaign management and fiduciary responsibility. All applications must be mailed to CFC Chairperson, AMSAM-CFC, Bldg. 3708, Redstone Arsenal, Ala. 35898-5795. Only federations, charitable organizations, or a combination of the two, are eligible to apply for the position.

Marshall Center Technology Expo is Wednesday

The Marshall Center Technology Exposition is from 10 a.m.-2 p.m. Wednesday in Bldg. 4203, Room 1201. There is no cost and all Marshall team members are welcome to attend. Some of the exhibits will include knowledge management solutions, data storage, embedded computer products, software and hardware, systems integration, IT solutions, disaster recovery and Web services. Refreshments and door prizes will be available. The event is sponsored by the Chief Information Office.

IAAP meeting is Tuesday

The International Association of Administrative Professionals will hold its monthly meeting from noon-1 p.m. Tuesday at 301 Sparkman Drive, Von Braun Hall, Room M-50 on the University of Alabama at Huntsville campus. A luncheon and networking session begins at 11:30 a.m. For more information, call Rene Holden at 5-7721. To order lunch, e-mail Paulette Bell at bellp@email.uah.edu.

Shuttle Buddies to meet Jan. 27

The Shuttle Buddies will meet at 9 a.m. on Jan. 27 at Mullins Restaurant on Andrew Jackson Way in Huntsville. For more information, call Deemer Self at 881-7757.

Blood drive set Friday

The American Red Cross blood drive is from 8 a.m.-1:30 p.m. Friday at Bldg. 4316. Donors will receive a certificate for a free pizza, Chick-fil-a sandwich and a T-shirt. Blood supplies are dangerously low and all blood types are needed.

Management Operations retirees to meet Jan. 23

The Management Operations Office retirees will meet for brunch at 10 a.m. Jan. 23 at the Cracker Barrel Restaurant in Madison. For more information, call 539-0042.

IFMP update rescheduled

A planned update to the Integrated Financial Management Program Core Financial System has been rescheduled for 5 p.m. Friday-6 a.m. Tuesday. IFMP SAP, Bankcard, BW and OLQR systems will be unavailable during the update.

Bldg. 4200 loading dock exit closed 3:45 p.m. weekdays

While maintenance work is performed in the loading dock basement area of Bldg. 4200, the exit door will be closed on weekends and from 3:45 p.m.-midnight on weekdays. The door will be used only as an emergency exit during this time. Work is scheduled for completion in about four weeks. The loading dock parking area will be barricaded during work times and stairs from the visitor parking area also will be unavailable.

'Take Our Children to Work Day' volunteers needed

Volunteers are needed to help plan the annual "Take Our Children to Work Day" events at the Marshall Center. A coordination meeting will be from 1-2:30 p.m. Jan. 28 in Bldg. 4200, Room 715. For more information, call Billie Swinford at 544-0087.

Phone book recycling ongoing

Old telephone books should be placed in the marked bins next to building entrances and/or elevator lobbies at the Marshall Center. Collection ends Jan. 31.

Marshall safety training set

The new Marshall Safety Culture Training is mandatory for all civil service and contractor employees who have not had the Dupont Safety Training. To register, go to the Safety, Health and Environmental Web site on 'Inside Marshall.' For more information, call Maria Hicks at 544-2571.

Employee Ads

Miscellaneous

- ★ Cosco car seat and stroller combo, \$15. 722-2109
- ★ Bicycle, 26", 12-speed, on- or off-road, #35. 430-6897
- ★ Entertainment Center corner cabinet, light solid Oak, TV space 38" diagonal, \$550. 881-2131
- ★ Olympic weight set, 370 lb., \$160; safety frame for lifting w/289 lb. Weight stack, \$275. 489-1275
- ★ Baby crib and changing table, solid oak, mattress, pad and sheets, \$250. 539-3166
- ★ Ford F150 heavy rubber bed mat, \$25. 971-9710
- ★ 1998 Mariah, 18', 4.3 Mercrusier, 13 hrs. use, hull warranty, kept in storage, \$13,000. 256-653-0612/880-8746
- ★ Federal Airtight wood burning insert or free standing stove, \$200. 828-3181
- ★ Handspring-Visor Prism, color, w/software, leather case, backup module, cradle, charger, other extras, \$250. 885-6006
- ★ SIG 232 stainless steel pistol w/case, 380 cal., \$425. 837-9479
- ★ Two wheel large 11.5 cu. ft. garden-way cart for yard & gardening, \$40. 881-4028
- ★ 1996 Suzuki King Quad 300, new tires, 4x4, brush guard, \$2,800 obo. 723-5170
- ★ 1979 vintage Yamaha GT80 motorcycle, original, runs, 2,300 miles, \$600. 325-6000
- ★ Beds, two premium firm twins, complete, 3 yrs. old, \$325. 880-6146
- ★ 20-ga. single-shot youth model gun, \$50. 256-882-0271
- ★ Ventless gas log, 18", 5-yr old. 539-3284
- ★ Couch and loveseat, traditional style, \$500. 233-1487
- ★ Two Daytona 500 tickets for Feb. 15-16, seats on backstretch. 772-8718
- ★ Kenmore dryer, \$100; Kenmore washer, \$100. 837-6649
- ★ Visor Prism w/software, leather case, backup module, gamepack module, travel charger, visor book, \$250. 885-6006
- ★ Kerosene heater, 10,000 BTU, never used, two full 5-gallon kerosene containers, \$100. 539-5401
- ★ Three Jersey calves, 14 months old, one heifer, one bull, one steer, \$1400 for all. 256-574-1542
- ★ 1997 18' Alumaweld Express Bass boat, 115 Yamaha motor, 2-depth finders, trolling motor, \$8,000. 830-1844
- ★ Portable chain-link fence dog pen, 8'x8', \$80; Lazy-Boy recliner, gold color, \$75. 881-8674
- ★ Little Tykes Grow-with-Me basketball goal, adjustable 4'-9', \$20. 830-4191
- ★ Atomic skis: 190cm, 933SE, team race w/tyrolia,

- bindings, \$100; 175 Monocap, AX01, Solomon, \$75. 722-8116
- ★ Compaq laptop, 14.1-850MH, batteries, 56K Modem, 24X-CDRom, 10GB hard-drive, carrying case, printer, \$1,000. 881-3661
- ★ Twin-sized daybeds, mattresses, bedspreads, matching cushions, and table, \$250. 533-4824
- ★ Packard Bell computer, 233MHz, 4.3GV, CDRom, modem, speakers, 15" monitor, Canon printer, \$250. 772-4984
- ★ Bose 901 speakers, pre-amp, stands, \$875; BMW M factory 5-speed aluminum shift knob, \$30. 922-1424
- ★ CKC Registered full-blooded Pit Bull puppies, \$150; Shizthu puppies, \$150. 751-4093
- ★ Diamondback Joker BMX 20" trick bike, black, \$100. 533-5942
- ★ Horse, paint gelding, 5 yrs. old, 14.3 hands high, well broken, \$1,350. 830-2001
- ★ Diamond engagement ring, 1/2 carat solitaire w/1/2 carat baguettes, \$1,200 obo. 922-9294
- ★ New HO train Atlas remote switches, automated crossing, turntable w/motor, more. Paid \$450. \$200/obo. 306-0700

Vehicles

- ★ 2001 Cadillac Seville SLS, crimson red, new tires, On-Star, 41K miles, 27,000. 464-0081
- ★ 1997 Cherokee Sport, 2-door, auto, air CD, 58K miles, \$7,900. 536-8480
- ★ 1968 Dodge Charger R/T, completely restored, 440 auto, console, white/black vinyl, \$22,500. 882-1566
- ★ 1996 Dodge Grand Caravan SE, 132K miles, 2nd sliding door, rear air, \$5,400. 864-3236/656-8902
- ★ 1990 Mazda 626, maroon, 5-speed, 190K miles, new battery/muffler, records available. \$2,200. 881-4748
- ★ 1988 Chevy K1500, 4x4 truck, V8, a/c, auto, 75K miles, \$4,000. 722-0417
- ★ 1995 Nissan Sentra GXE, green, automatic, electric locks/windows, AM/FM/cassette, \$2,700. 527-4306
- ★ 1994 Dodge Stealth, red, 123K miles, 40K miles transmission, \$4,990. 520-4010
- ★ 1977 Ford F150, 4WD, automatic, rebuilt engine, \$2,500. 931-937-7830 after 5:30 p.m.
- ★ 1991 Mercury Grand Marquis LS; Airstream trailer. 881-6040
- ★ 2001 Honda Civic EX, power windows/locks, moonroof, CD/radio, 4-door, one-owner, \$12,900. 830-8435
- ★ 1991 Ford Econoline High-top customized conversion van, TV/VCR, 102K miles, \$7,500. 586-8483

- ★ 1976 Datsun 280Z, blue, engine & interior good, some new parts, \$1,300 obo. 256-880-5838
- ★ 1997 Dodge Grand Caravan Sport, 114K miles, second sliding door, loaded, \$5,300. 650-0899
- ★ 2000 Chevrolet commercial cargo Astro van, \$8,000 obo. 256-882-6861
- ★ 1996 Jeep Cherokee Sport, white/gray interior, 6-cyl., 4-door, 4WD, pwr windows/locks, \$7,000. 256-325-3684
- ★ 1998 Ford Taurus SE, V6, all-power, tilt, dark green, 97K highway miles, \$5,400. 772-6769
- ★ 1980 Chevy 4x4 pickup, 4-speed transmission w/granny low, 350/V8, no bed, \$1,200 obo. 683-9364
- ★ 1991 Toyota Camry DX, 4-cylinder, 150K miles, \$1,800. 156-325-3323
- ★ 1997 Dodge Caravan w/warranty, PW/PDL, ABS, roof rack, privacy glass, 5-door, \$7,600. 230-6846
- ★ 2002 Honda Civic LX, 4-door, auto, all-power, 34-41 mpg, 13K miles, \$13,000 obo. 828-6213
- ★ 1992 Acura Integra GS, 3-door, auto, electric windows/locks, sunroof, new paint/tires, \$4,950. 232-3836/683-0702
- ★ 1991 Ford Explorer XLT, hunter green, tan interior, power windows/locks, 175K miles, \$3,450. 256-337-6547
- ★ 1996 Chevrolet Silverado Z71, 4x4, extra cab, 3rd door, \$10,300. 233-5161

Free

- ★ To good home female boxer/lab, 6-months, all shots, very friendly and playful. 464-8506
- ★ To loving homes, two male outdoor Dalmatians, 11-months, shots, wormed, partially trained. 756-766-9348/Jeff
- ★ Fill dirt, you load, you haul. 656-2965/351-6066/656-5552
- ★ Puppies from medium sized mixed breed dogs, 3 males. 971-1414

Lost

- ★ Gold AJT service pin in Bldg. 4200 area, shield-shaped w/red enameling. 828-4055/544-4483

Wanted

- ★ Dell latitude series computer notebook w/processor speed 500 MHz or greater. 256-881-0656 after 5 p.m.
- ★ Dog house in good condition suitable for a medium sized dog, reasonably priced. 256-685-0308

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